



Echo vs reverberation

Sound is a mechanical wave, which travels through a medium from one location to another. This motion through a medium occurs as one particle of the medium interacts with its neighbouring particle, transmitting the mechanical motion and corresponding energy to it. This transport of mechanical energy through a medium by particle interaction is what makes a sound wave a mechanical wave.

Reflection of sound waves off of barriers results in some observable behaviours, which you have likely experienced. If you have ever been inside of a large canyon, you have likely observed an echo resulting from the reflection of sound waves off the canyon walls. Suppose you are in a canyon and you give a *holler*. Shortly after the *holler*, you would hear the echo of the *holler*, a faint sound resembling the original sound. This echo results from the reflection of sound off the distant canyon walls and its ultimate return to your ear. If the canyon wall is more than approximately 17 metres away from where you are standing, then the sound wave will take more than 0.1 seconds to reflect and return to you. Since the perception of a sound

usually endures in memory for only 0.1 seconds, there will be a small time delay between the perception of the original sound and the perception of the reflected sound.

A reverberation is quite different than an echo. A reverberation is perceived when the reflected sound wave reaches your ear in less than 0.1 seconds after the original sound wave. Since the original sound wave is still held in memory, there is no time delay between the perception of the reflected sound wave and the original sound wave. The two sound waves tend to combine as one very prolonged sound wave. If you have ever sung in the shower (and we know that you have), then you have probably experienced a reverberation. The Pavarotti-like sound, which you hear, is the result of the reflection of the sounds you created combining with the original sounds. Because the shower walls are typically less than 17 metres away, these reflected sound waves combine with your original sound waves to create a prolonged sound: a reverberation.

(Taken from <http://www.physicsclassroom.com/mmedia/waves/er.cfm>)

EXERCISES

1 True or false?

- a. The perception of a sound endures in memory for 1 second. T F
- b. Sound is a mechanical wave, which travels through a medium. T F
- c. A reverberation is quite different than an echo. T F
- d. You have probably never experienced a reverberation. T F

2 Order the words to make sentences.

- a. medium • wave • Sound • through • is • travels • a • mechanical • which • a
- b. sound • An • faint • echo • sound • is • a • the • original • resembling
- c. seconds • The • endures • of • a • memory • sound • in • for • usually • only • 0.1 • perception
- d. sound • wave • is • perceived • when • the • reaches • A • reverberation • seconds • your • ear • in • less • reverberation • than • 0.1 • reflected • sound • wave • after • the • original

3 Match questions and answers.

QUESTIONS		ANSWERS	
A	What happens during a reverberation?	1	The time that the reflected sound takes to reach your ear: if it is less than 0.1 seconds it is a reverberation, otherwise an echo is heard.
B	What is the main difference between an echo and a reverberation?	2	Sound travelling through a medium transports mechanical energy, for this reason it is a mechanical wave.
C	Why is sound a mechanical wave?	3	You hear the two sound waves as one very prolonged sound wave, because the original sound is still in your memory when the reflected sound arrives back.
A		B	
		C	